

NEVADA CREEK DAM

Manual for Operation and Maintenance

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**State Water Projects Bureau
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Department of Natural Resources and Conservation
1520 East Sixth Avenue
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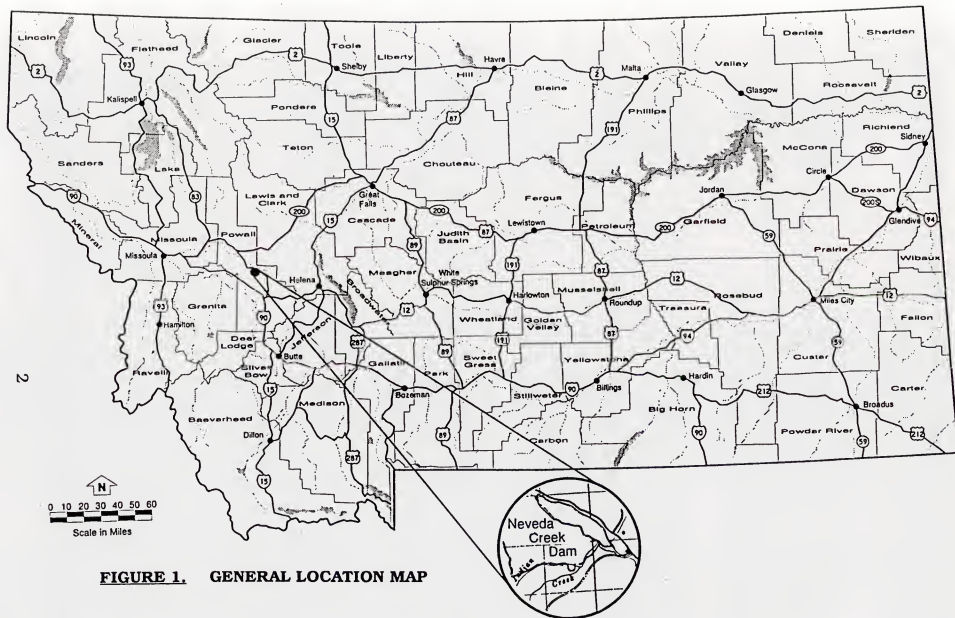
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OVERVIEW

Nevada Creek Dam is located on Nevada Creek in Powell County. The project is approximately 12 miles upstream of the town of Helmville (Figure 1). The Nevada Creek Water Users Association (herein called "association") operates and maintains the dam.

The earthfill dam was completed in 1938. Nevada Creek Dam is 105 feet high and 1,083 feet long. The dam's outlet works consist of a 5-foot diameter outlet pipe, a 8-foot diameter gate tower with two 54-inch diameter valves (slide gate emergency gate located upstream and a butterfly operating gate located downstream). The controls are located in the gate tower. The maximum capacity of the outlet works is 933 cubic feet per second (cfs). The spillway is a concrete-lined chute with a 100-foot-wide crest and the chute tapers to 30 feet wide. The maximum capacity of the spillway is 15,900 cfs at the dam crest. The estimated safe capacity of the spillway is 4,530 cfs.

Water from the reservoir primarily is used for irrigation water supply. The reservoir also is used for water-based recreation and the regulation of stream flow rates.



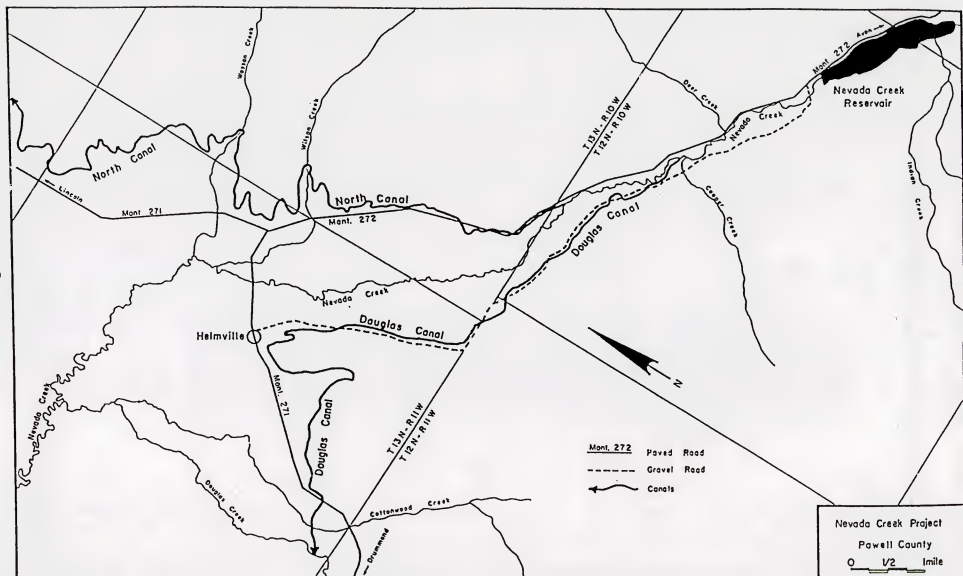


FIGURE 2. PROJECT AREA MAP

STATISTICAL INFORMATION

1. General

- | | |
|-----------------------|---|
| a) Owner | Montana Department of Natural Resources and Conservation (DNRC) |
| b) Operator | Nevada Creek Water Users Association |
| c) Location | Sections 11 & 14, Township 12 North, Range 10 West |
| d) Latitude | 46° 48' 06" |
| Longitude | 112° 48' 42" |
| e) County--State | Powell--Montana |
| f) Watershed Location | Nevada Creek, Blackfoot River basin |
| g) Drainage Area | 145 square miles |

2. Principal Elevations (feet above mean sea level)

- | | |
|----------------------|--------------|
| a) Maximum Dam Crest | 4,627.5 feet |
| b) Normal Full Pool | 4,616.0 feet |

3. Reservoir

- | | |
|---|--------------|
| a) Length of Maximum Pool (approximate) | 2 miles |
| b) Maximum Reservoir Level | 4,627.5 feet |
| c) Surface Area at Normal Pool | 368 acres |

4. Storage

- | | |
|--|------------------|
| a) Maximum Storage
(elevation 4,627.5 feet) | 17,300 acre-feet |
| b) Normal Storage
(elevation 4,616 feet) | 12,640 acre-feet |
| c) Maximum Surcharge
(elevation 4,627.5 feet) | 4,660 acre-feet |

5. Hydrology

- | | |
|---------------------------------|--|
| a) Inflow Design Flood | Probable Maximum Flood
(PMF) (19,733 cfs peak flow) |
| b) 500-Year Return Period Flood | 4,533 cfs |
| c) 100-Year Return Period Flood | 3,190 cfs |

6. Embankment (Dam)

- | | |
|---|------------|
| a) Type | Earthfill |
| b) Structural Height | 105 feet |
| Hydraulic Height | 88 feet |
| c) Crest Length | 1,083 feet |
| d) Crest Width | 25 feet |
| e) Downstream Slope | 1v on 2h |
| f) Upstream Slope
(above elevation 4,616.0 feet) | 1v on 3h |
| g) Upstream Slope
(below elevation 4,616.0 feet) | 1v on 2h |
-
-

7. Outlet Works

- | | |
|---|--|
| a) Size | 5-foot diameter reinforced concrete pipe |
| b) Length | 472 feet |
| c) Control | 54-inch diameter gate valve upstream (emergency gate) and a 54-inch butterfly valve (operating gate)--gate valve is operated from the bottom of a 8-foot diameter tower, while the butterfly valve is operated from the top of the tower |
| d) Capacity at 4,616.0 Feet (Normal Pool Elevation) | 860 cfs |
| e) Capacity at 4,627.5 Feet (Minimum Dam Crest Elevation) | 933 cfs |
| f) Top of the Intake Tower | 4,540.8 feet |
| g) Design Invert Elevation | 4,540.0 feet |
| h) Trashrack | Yes |

8. Spillway

- | | |
|---|-----------------------------------|
| a) Location | Left abutment |
| b) Type | Uncontrolled ogee |
| c) Crest Elevation | 4,616.0 feet |
| d) Width | 100 feet wide tapering to 30 feet |
| e) Length | Approximately 500 feet |
| f) Capacity (at Elevation 4,627.5 Feet) | 15,900 cfs |
-
-

OPERATING PROCEDURES

The association manages Nevada Creek Dam to provide an adequate supply of irrigation water to meet contracts with water users without exceeding safe storage or flow levels. Another goal is to insure safe operation of the project.

Method and Schedule of Operation

The beginning date of irrigation releases varies from year to year, with May 1 being the earliest that irrigation releases begin. The last irrigation releases typically are made by September 30 as specified in the water purchase contracts. All dates tend to vary depending on each year's actual climatological and hydrological conditions. Water is also released from the dam to help regulate instream flows. These releases depend on the yearly flow conditions in the Nevada Creek.

The maximum reservoir elevation for winter storage is 4,608.0 feet with 9,803 acre-feet of storage. This winter maximum helps prevent damage to the riprap and embankment from wind-driven waves and ice. The minimum reservoir elevation for winter storage is 4,575 feet with 1,500 acre-feet of storage. This winter minimum helps prevent ice damage to the inlet structure for the outlet works, minimizes water quality problems, and helps to maintain the fishery.

Safe Drawdown

Because the stability of Nevada Creek Dam has not been thoroughly investigated, DNRC recommends that drawdown rates not exceed one foot per day.

Limitations of Appurtenances

The maximum design capacity of the spillway, with the reservoir at the dam's crest, is 15,900 cfs. However, the spillway chute walls may be overtopped at lesser discharges. Hydraulic and structural analysis conducted by SWPB indicate that the spillway is probably adequate to pass a flow of 4,530 cfs, the 500-year flood flow, but the passing of higher flows is questionable. The maximum capacity of the outlet conduit, with the reservoir at the dam's crest, is 933 cfs. Therefore, the combined maximum design conveyance capacity of Nevada Creek Dam is 16,833 cfs. A more reasonable maximum combined capacity is nearer to 5,000 cfs. The spillway rating table is shown in Appendix A.

The maximum amount that the operating gate can be opened is 27 inches. The maximum opening for the emergency gate is 54 inches. These distances are measured from the top of the gate stem to the top of the gate pedestal.

Dam Operator

The responsibility for the daily operation of the dam and reservoir rests with the association and its dam operator. The dam operator is

generally authorized to operate the reservoir to meet the association's goal. The dam operator's specific responsibilities are to:

1. *Operate the mechanical features of the outlet works*
2. *Coordinate filling of the reservoir and the release of water*
3. *Notify the State Water Projects Bureau (SWPB) of unusual occurrences such as impending floods, excessive seepage, etc.*
4. *Perform various maintenance tasks*
5. *Monitor weather conditions*
6. *Monitor seepage*

Typically, the out-going dam operator, the association, and SWPB train a new dam operator. The dam operator's training focuses on the mechanical operation of the gates, measurement of the storage level, measurement of the rate of water release, daily observation of unusual conditions, and record keeping. The outlet gates are normally operated manually with a hand crank. During the inspections by the SWPB, the outlet gates are operated by a portable electric pipe-threading tool, fitted with an adapter to fit the gate's operating shaft. The pipe-threading tool is powered by a portable generator that is brought to the site. The outlet works are intended to be used for controlling the release of irrigation water and not for providing emergency relief.

The dam operator is normally available daily to observe the dam and perform operating functions during the times of rapid reservoir filling. During the remainder of the filling and irrigation seasons, the

operator is at the dam three to five times per week. At other times the operator visits the dam weekly or monthly. Communication among the dam operator, the association, and the SWPB usually takes place by telephone. Although not routinely available, radio communication may be established during emergencies or unusual occurrences so that the dam operator can speak directly with county authorities and communicate indirectly with the SWPB (see *Nevada Creek Dam Emergency Action Plan*).

Weather Monitoring

The dam operator monitors weather conditions through local weather forecasts and the National Weather Service.

Interaction with Other Dams

Except for irrigation diversion dams, Milltown Dam at Bonner is the next dam downstream from Nevada Creek Dam. The safety of the irrigation diversion dams is not affected by the normal operation of Nevada Creek Dam. There are no large dams located above Nevada Creek Dam. Therefore, interaction with other dams is not a concern during normal operations.

If it appears that Nevada Creek Dam will breach, or during other emergency operations, the dam operator will initiate the *Nevada Creek Dam Emergency Action Plan* and notify the Montana Power Company Systems Dispatcher Control Center (**406-494-4131 or 406-723-5421**) so that they can initiate their Emergency Plan for Milltown Dam.

INSPECTION AND MONITORING

The SWPB will inspect the dam annually. Appendix B includes an example of a SWPB inspection checklist. In addition to annual inspections, a SWPB engineer will inspect the dam and reservoir during and after heavy runoff; after severe rainstorms and windstorms; during high storage periods, and after an earthquake. The embankment is not monitored by instrumentation.

Structural Features Inspection

Structural features include the gatehouse, outlet works, and spillway (Figure 3). The SWPB will inspect these structures annually as part of its inspection program. Items to be checked or noted include, but are not limited to:

1. *Outlet Works*
 - a) Any differential settlement or movement resulting in cracking of the conduit
 - b) Erosion of the seals or concrete by cavitation immediately downstream of the gates
 - c) Major seepage of water into the conduit
 - d) Major deterioration of exposed concrete due to freeze/thaw cycles or sulfate reactions
 - e) Operation of both gates through a full cycle
 - f) Free, unobstructed operation of the air vent
 - g) Corrosion of any metal
 - h) Proper lubrication of the pedestals
-

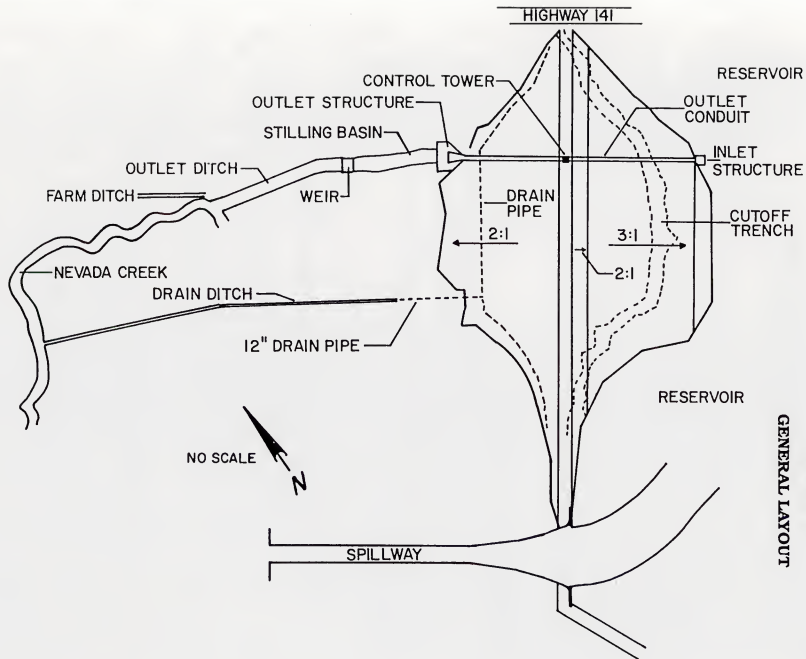


FIGURE 3.
GENERAL LAYOUT

-
2. *Gatehouse* -- Any damage or vandalism
 3. *Embankments*
 - a) Erosion gullies in dam and dike faces.
 - b) Damage from burrowing animals or vegetation.
 - c) Displacement or loss of rip-rap protection.
 - d) Displacement of fill, sink holes, slumps etc.
 - e) Any seepage.
 4. *Spillway*
 - a) Deterioration of concrete
 - b) Separation or movement of joints
 - c) Erosion of the spillway chute, backfill behind the walls, or stilling basin
 - d) Blockage of the approach or exit channel

Riprap Inspection

The riprap along the faces of the dam should be at least 30 inches thick. Immediately after the occurrence of high water, SWPB personnel will inspect the riprap and determine if additional riprap is necessary.

Seepage Monitoring

Seepage has been observed along the right side of the outlet channel, above the outlet, and along the lower road in the left abutment. There has been no observed sediment in the seepage water. There is a toe drain that exits in the channel to the left of the outlet channel. The outlet end of the drain pipe is submerged.

These areas of seepage will be observed and monitored by the dam operator during regular visits and by the SWPB during annual inspections. To date, seepage measuring equipment has not been installed at the dam. The SWPB is considering installing seepage measuring equipment, but has not yet determined what type of equipment is necessary.

MAINTENANCE

The association is responsible for the project's routine maintenance. During regular visits, the dam operator will identify and perform normal maintenance activities. During the annual inspections, the SWPB will identify items that need maintenance or repair. The association will be required to perform the maintenance items within the time periods specified. The SWPB will supervise major repairs.

Routine Maintenance

As soon as a need is identified, the dam operator will perform any routine maintenance necessary to protect the dam or keep it in good working order. The dam operator will watch for any potential maintenance requirements during normal visits to the dam. Items that may occasionally need attention include, but are not limited to:

1. *Lubrication of gate-operating mechanisms.*
2. *Debris or silt restricting the spillway inlet or the outlet works.* Accumulated debris that could affect the operation of these appurtenances will be removed at once, with all debris removed at least annually.
3. *Erosion gullies on embankment.* Development of erosion gullies will be checked immediately. Gullies will be filled, compacted, and seeded. Particular attention will be paid to the abutment contact areas and the downstream faces where four-wheel-drive tracks may become a problem.
4. *Rodent damage.* Rodent burrows will be filled immediately and the rodents removed or destroyed.

-
-
5. *Upstream slope riprap.* Reservoir riprap normally will be maintained annually, but may occasionally need repairs because of high water or wave action.
 6. *Vegetative cover on downstream slopes.* Good vegetative cover will be maintained, but large brush and trees will be removed.

Annual Maintenance

The SWPB will conduct annual inspections of Nevada Creek Dam and Reservoir. During these inspections, any items that require maintenance will be identified and recorded. Items that need annual maintenance include the spillway, outlet works, gates, riprap, roads, and gatehouse. Any other routine items that need immediate attention also will be noted including removal of trees or brush.

After the association receives the inspection report, it will develop a maintenance schedule to perform identified maintenance tasks. While the dam operator or association members may perform the routine tasks, major repairs are more likely to be performed by a contractor. The SWPB will assist in contracting for repairs and may supervise the repair work.

Record Keeping

The SWPB will maintain records--including photographs--of all inspections and maintenance requirements. These records will also include flow measurements and storage volumes. Anyone who wants to review these records may do so in the SWPB's office at the Department of Natural Resources and Conservation in Helena.

The dam operator will keep records of the reservoir elevation, seepage observations or measurements, and any unusual conditions. These records may be reviewed at the dam operator's house.

REFERENCES

HKM Associates, January 1981. *Phase 1 Inspection Report, National Dam Safety Program, Nevada Creek Dam, Helmville Montana, Powell County, MT-17.* Prepared for the State of Montana (DNRC) under the U.S. Army Corps of Engineers National Dam Safety Program.

APPENDIX A

RATING CURVES AND TABLES

TABLE A-1**NEVADA CREEK DAM****LIVE STORAGE**

<u>SLOPE</u> <u>DISTANCE</u>	<u>ELEV.</u> <u>(Feet)</u>	<u>CONTENTS</u> <u>(Acre-feet)</u>	<u>SLOPE</u> <u>DISTANCE</u>	<u>ELEV.</u> <u>(Feet)</u>	<u>CONTENTS</u> <u>(Acre-feet)</u>	
0+00	4620.00	14,230	Top of Pin #1	+36	14.15	11,945
+05	18.61	13,645		+37	14.11	11,931
+06	18.54	13,615		+38	14.13	11,938
+07	18.19	13,468		+39	14.02	11,899
+08	17.97	13,377		0+40	4613.91	11,859
+09	17.75	13,293		+41	13.87	11,845
0+10	4617.66	13,259		+42	13.74	11,799
+11	17.61	13,240		+43	13.70	11,784
+12	17.61	13,240		+44	13.62	11,756
+13	17.64	13,251		+45	13.47	11,703
+14	17.53	13,209	+46	13.40	11,678	
+15	17.42	13,168	+47	13.25	11,624	
+16	17.31	13,126	+48	13.18	11,599	
+17	17.25	13,103	+49	13.07	11,560	
+18	17.20	13,084	0+50	4613.95	11,874	Top of Pin #2
+19	17.12	13,054	0+50	12.95	11,518	
0+20	4617.08	13,038	+51	12.82	11,471	
+21	16.99	13,004	+52	12.73	11,439	
+22	16.77	12,921	+53	12.62	11,400	
+23	16.59	12,852	+54	12.46	11,342	
+24	16.40	12,780	+55	12.30	11,286	
+25	16.14	12,681	+56	12.18	11,243	
+25.7	16.00	12,628	Concrete Crest	+57	12.03	11,190
+26	15.93	12,601		+58	11.95	11,161
+27	15.66	12,499	+59	11.91	11,146	
+28	15.55	12,457	0+60	4611.73	11,082	
+29	15.32	12,370	+61	11.54	11,014	
0+30	4615.19	12,320	+62	11.47	10,990	
+31	14.99	12,245	+63	11.31	10,932	
+32	14.79	12,174	+64	11.09	10,854	
+33	14.69	12,138	+65	11.03	10,833	
+34	14.50	12,070	+66	10.79	10,748	
+35	14.26	11,985	+67	10.62	10,687	

TABLE A-1 continued

SLOPE DISTANCE	ELEV. (Feet)	CONTENTS (Acre-feet)	SLOPE DISTANCE	ELEV. (Feet)	CONTENTS (Acre-feet)
+68	10.52	10,651	+03	05.33	8,917
+69	10.32	10,580	+04	05.16	8,861
0+70	4610.17	10,527	+05	05.07	8,831
+71	10.01	10,470	+06	04.82	8,753
+72	09.85	10,416	+07	04.58	8,679
+73	09.76	10,386	+08	04.43	8,633
+74	09.65	10,350	+09	04.21	8,565
+75	09.50	10,300	1+10	4603.75	8,424
+76	09.32	10,240	+11	03.53	8,357
+77	09.18	10,194	+12	03.26	8,274
+78	08.98	10,128	+13	03.07	8,215
+79	08.79	10,065	+14	02.86	8,152
0+80	4608.70	10,035	+15	02.64	8,084
+81	08.59	9,999	+16	02.39	8,008
+82	08.43	9,946	+17	02.26	7,968
+83	08.25	9,886	+18	01.79	7,823
+84	08.20	9,869	+19	01.68	7,790
+85	08.01	9,806	1+20	4601.37	7,695
+86	07.86	9,756	+21	01.09	7,609
+87	07.68	9,696	+22	00.81	7,523
+88	07.54	9,650	+23	00.57	7,449
+89	07.45	9,620	+24	00.39	7,394
0+90	4607.27	9,561	+25	00.28	7,360
+91	07.21	9,541	+26	00.03	7,283
+92	07.06	9,491	+27	99.78	7,212
+93	06.96	9,458	+28	99.70	7,190
+94	06.71	9,375	+29	99.40	7,105
+95	06.61	9,342	1+30	4599.17	7,040
+96	06.41	9,276	+31	98.85	6,949
+97	06.22	9,213	+32	98.57	6,870
+98	06.09	9,170	+33	98.34	6,805
+99	05.95	9,123	+34	98.13	6,746
1+00	4606.85	9,422	+35	97.91	6,684
1+00	05.81	9,077	+36	97.63	6,605
+01	05.67	9,030	+37	97.32	6,517
+02	05.54	8,987	+38	97.06	6,444

TABLE A-1 *continued*

SLOPE DISTANCE	ELEV. (Feet)	CONTENTS (Acre-feet)	SLOPE DISTANCE	ELEV. (Feet)	CONTENTS (Acre-feet)
+39	96.87	6,390	+74	86.20	3,692
1+40	4596.64	6,325	+75	85.89	3,620
+41	96.35	6,243	+76	85.74	3,585
+42	96.09	6,169	+77	85.59	3,550
+43	95.66	6,048	+78	85.48	3,524
+44	94.98	5,856	+79	85.25	3,470
+45	94.95	5,849	1+80	4585.09	3,433
+46	94.79	5,808	+81	84.96	3,403
+47	94.58	5,754	+82	84.86	3,382
+48	94.26	5,672	+83	84.71	3,351
+49	93.95	5,593	+84	84.46	3,299
1+50	4594.51	5,736	+85	84.33	3,272
1+50	93.65	5,516	+86	84.17	3,238
+51	93.42	5,457	+87	83.83	3,168
+52	92.67	5,264	+88	83.42	3,083
+53	92.30	5,169	+89	83.07	3,010
+54	92.22	5,148	1+90	4582.60	2,911
+55	91.75	5,028	+91	82.08	2,803
+56	91.60	4,990	+92	81.84	2,753
+57	91.16	4,877	+93	81.58	2,699
+58	90.73	4,766	+94	81.28	2,636
+59	90.50	4,707	+95	80.46	2,465
1+60	4590.32	4,661	+96	80.21	2,413
+61	89.95	4,568	+97	79.78	2,331
+62	89.48	4,458	+98	79.58	2,296
+63	89.06	4,360	+99	79.32	2,250
+64	88.86	4,313	2+00	4578.85	2,167
+65	88.44	4,215	2+00	78.76	2,151
+66	88.23	4,166	+01	78.42	2,092
+67	88.06	4,126	+02	78.08	2,032
+68	87.64	4,028	+03	77.74	1,973
+69	87.42	3,977	+04	77.40	1,913
1+70	4587.16	3,916	+05	77.06	1,855
+71	86.81	3,834	+06	76.72	1,793
+72	86.46	3,752	+07	76.38	1,734
+73	86.34	3,724	+08	76.04	1,674

TABLE A-1 continued

<u>SLOPE DISTANCE</u>	<u>ELEV. (Feet)</u>	<u>CONTENTS (Acre-feet)</u>	<u>SLOPE DISTANCE</u>	<u>ELEV. (Feet)</u>	<u>CONTENTS (Acre-feet)</u>
+09	75.70	1,615	+45	62.91	299
2+10	4575.36	1,555	+46	62.44	273
+11	75.02	1,496	+47	61.99	248
+12	74.69	1,452	+47.8	61.80	238 {Top Intake
+13	74.35	1,408	+48	61.76	235
+14	74.01	1,364	+49	61.49	221
+15	73.68	1,322	2+50	4561.30	210
+16	73.34	1,278	+51	61.14	202
+17	73.00	1,234	+52	60.90	189
+18	72.66	1,190	+53	60.70	178
+19	72.33	1,148	+54	60.24	153
2+20	4571.99	1,104	+55	59.75	134
+21	71.67	1,062	+56	59.35	124
+22	71.35	1,021	+57	59.00	115
+23	71.03	980	+58	58.71	108
+24	70.71	939	+59	57.97	90
+25	70.39	897	2+60	4557.45	77
+26	70.07	856	+61	56.86	62
+27	69.75	825	+62	56.29	48
+28	69.43	797	+63	55.53	29
+29	69.11	770	+64	54.84	15
2+30	4568.79	742	This table was developed from surveys made in 1972, 1973 and 1988.		
+31	68.55	721			
+32	68.13	684			
+33	67.82	657			
+34	67.32	614			
+35	66.84	572			
+36	65.99	498			
+37	65.56	461			
+38	65.31	439			
+39	64.94	409			
2+40	4564.44	382			
+41	64.11	364			
+42	63.64	338			
+43	63.42	326			
+44	63.11	309			

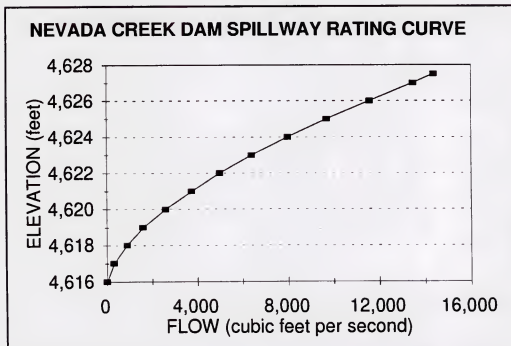
TABLE A-2
NEVADA CREEK DAM
ELEVATION — STORAGE

ELEVATION <i>(feet)</i>	STORAGE <i>(acre-feet)</i>	ELEVATION <i>(feet)</i>	STORAGE <i>(acre-feet)</i>
4,616	12,640	4,583	3,006
4,615	12,260	4,582	2,798
4,614	11,904	4,581	2,589
4,613	11,547	4,580	2,380
4,612	11,191	4,579	2,209
4,611	10,834	4,578	2,030
4,610	10,478	4,577	1,854
4,609	10,146	4,576	1,679
4,608	9,815	4,575	1,504
4,607	9,483	4,574	1,374
4,606	9,152	4,573	1,246
4,605	8,820	4,572	1,117
4,604	8,513	4,571	988
4,603	8,206	4,570	859
4,602	7,900	4,569	772
4,601	7,503	4,568	685
4,600	7,286	4,567	598
4,599	7,004	4,566	511
4,598	6,721	4,565	424
4,597	6,439	4,564	370
4,596	6,156	4,563	315
4,595	5,876	4,562	261
4,594	5,617	4,561	206
4,593	5,361	4,560	152
4,592	5,104	4,559	127
4,591	4,848	4,558	102
4,590	4,591	4,557	78
4,589	4,358	4,556	53
4,588	4,124	4,555	28
4,587	3,891	4,554	26
4,586	3,657	4,553	12
4,585	3,424	4,552	4
4,584	3,215	4,551.5	0

Includes 12 acre-feet of dead storage.
Table is from January 1962.

TABLE A-3**Nevada Creek Dam Spillway Rating Table**

Elevation <i>(feet)</i>	Flow <i>(cfs)</i>
4,616.0	0
4,617.0	320
4,618.0	900
4,619.0	1,600
4,620.0	2,600
4,621.0	3,750
4,622.0	5,000
4,623.0	6,400
4,624.0	8,000
4,625.0	9,700
4,626.0	11,600
4,627.0	13,500
4,627.5	14,400

FIGURE A-1

APPENDIX B

INSPECTION CHECKLIST

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
DAM SAFETY INSPECTION REPORT

NAME OF DAM _____
DATE INSPECTED _____

INVENTORY NO. _____
HAZARD CATEGORY _____
TYPE OF DAM _____
YEAR BUILT _____

OWNER _____
OPERATOR _____
STREAM _____
DRAINAGE AREA _____

Reservoir Storage Status

	Water Surface Elevation (feet)	Storage (acre-feet)
At time of inspection	_____	_____
At spillway crest	_____	_____
At min. dam crest elevation	_____	_____
Flashboard crest elevation	_____	_____

ITEM	YES	NO	REMARKS	*ICC
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1. EMBANKMENT

A. Crest -- Height= _____ Length= _____ Width= _____

(1) Any visual settlements?				3
(2) Any misalignments?				4
(3) Any cracking?				1
(4) Any traffic damage?				5
(5) Other?				7

NOTE: *ICC stands for "Inventory Comment Code" which is found on the Inventory of Montana Dams. This comment code is for use by the Dam Safety Section.

ITEM	YES	NO	REMARKS	*ICC
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1. EMBANKMENT (continued)

B. Upstream Face -- Slope=

(1) Any erosion?				19
(2) Any longitudinal cracks?				9
(3) Any transverse cracks?				9
(4) Is riprap protection adequate?				10
(5) Any stone deterioration?				19
(6) Any visual settlement, slumps, sloughing, depressions or bulges?				9
(7) Adequate grass cover?				14
(8) Debris on the dam face?				15
(9) Other?				16

C. Downstream Face--Slope=

(1) Any erosion?				22
(2) Any longitudinal cracks?				19
(3) Any transverse cracks?				19
(4) Any visual settlement, sloughing, slumps, depressions or bulges?				19
(5) Is the toe drain dry?				31
(6) Are the relief wells flowing?				31
(7) Any boils at the toe?				19
(8) Any seepage areas?				17, 18
(9) Any traffic or animal damage?				22
(10) Any burrowing animals?				21
(11) Adequate grass cover?				21
(12) Other?				25

D. Amount and Type of Vegetation on the Dam

	14, 24
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ITEM	YES	NO	REMARKS	*ICC
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2. ABUTMENT CONTACTS

(A) Any erosion?				12, 20
(B) Any visual differential movement?				12, 20
(C) Any cracks?				12, 20
(D) Any seepage present?				36
(E) Other?				16, 25

3. OUTLET WORKS

A. Intake Structure -- Size=

(1) Any settlement?				70
(2) Any tilting?				70
(3) Do concrete surfaces show:				
a. Spalling?				70
b. Cracking?				70
c. Erosion?				70
d. Exposed reinforcement?				70
(4) Do joints show:				
a. Displacement or offset?				70
b. Loss of joint material?				70
c. Leakage?				70
(5) Metal appurtenances:				
a. Any corrosion present?				70
b. Any breakage present?				71
(6) Trash rack?				71
a. Condition?				71
b. Anchor system secure?				71
(7) Other?				71

ITEM	YES	NO	REMARKS	*ICC
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3. OUTLET WORKS (continued)

B. Conduit -- Type = Size =

(1) Do concrete surfaces show:				
a. Spalling?				76
b. Cracking?				76
c. Erosion?				76
d. Exposed reinforcement?				76
(2) Do joints show:				
a. Displacement or offset?				76
b. Loss of joint material?				76
c. Leakage?				76
(3) Is the conduit metal?				76
a. Any corrosion present?				76
b. Protective coatings adequate?				76
(4) Is the conduit misaligned?				76
(5) Any calcium deposits?				76
(6) Other?				76

C. Gates and Tower

(1) Gates:				73, 74
a. Size: Operating:			Emergency:	
b. Type: Operating:			Emergency:	
(2) Controls operational?				76
(3) Controls lubricated?				76
(4) Operational problems?				76
(5) Leakage around gates?				73, 74
(6) Condition of gate seals?				73, 74
(7) Any cavitation damage? If so, describe?				73, 74
(8) Describe air vent-size and condition.				73, 74

ITEM	YES	NO	REMARKS	*ICC
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3. OUTLET WORKS

C. Gates and Tower (continued)

(9) Is there a jet pump?				82
a. Is it operational?				62
b. Leakage?				62
(10) Is the tower dry? wet?				77
(11) Any seepage in the tower?				77
(12) Condition of the tower?				77
(13) Any safety problems?				77
(14) Ladder in good condition?				77
(15) Condition of the gate house?				81
(16) Emergency plan completed for the dam?				43
a. Posted in the gatehouse?				43
(17) Other?				82

D. Stilling Basin

(1) Do concrete surfaces show:				
a. Spalling?				62
b. Cracking?				62
c. Erosion?				62
d. Exposed reinforcement?				62
(2) Do joints show:				
a. Displacement or offset?				62
b. Loss of joint material?				62
c. Leakage?				62
(3) Do energy dissipators show:				
a. Signs of deterioration?				62
b. Are they covered with debris?				62
(4) Other?				63

ITEM	YES	NO	REMARKS	*ICC
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3. OUTLET WORKS (continued)

E. Downstream Channel

(1) Is the channel:				
a. Eroding or backcutting?				38
b. Sloughing?				38
c. Obstructed?				40
(2) Is released water:				
a. Undercutting the outlet?				52, 62
b. Eroding the embankment?				52, 62
(3) Other?				56, 63

4. SPILLWAY

A. Description

(1) Location?				N/A
(2) Type of Spillway?				N/A
(3) Size of Spillway?				N/A
(4) Spillway lining?				N/A
(5) Is there a weir?				61
(6) Is the spillway in good condition?				N/A
(7) Any drains?				N/A
a. Describe the condition of drains.				64

B. Does spillway show:

(1) Any cracking concrete?				57, 58
(2) Any spalling concrete?				57, 58
(3) Any exposed reinforcement in the concrete?				57, 58
(4) Any erosion?				52

ITEM	YES	NO	REMARKS	*ICC
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4. B. Does spillway show: (continued)

(5) Any slope sloughing?				51
(6) Any obstructions?				54
(7) Displacement or offset joints?				59
(8) Loss of joint material?				57, 58
(9) Leakage at the joints?				57, 58
(10) Other?				63

C. Do the energy dissipators show:

(1) Signs of deterioration?				62
(2) Any cracking?				62
(3) Any spalling?				62
(4) Any exposed reinforcement?				62
(5) Are they covered with debris?				62
(6) Other?				64

D. Has release water:

(1) Eroded the embankment?				52
(2) Undercut the outlet?				52
(3) Eroded the downstream channel?				52
(4) Other?				56

E. Emergency Spillway

(1) Is there an emergency spillway?			(If YES, describe)	55

ITEM	YES	NO	REMARKS	*ICC
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5. RESERVOIR CONTROL

(A) Recent upstream development?				48
(B) Recent downstream development?				48
(C) Slides in reservoir area?				44
(D) Change in reservoir operation?				48
(E) Large impoundment upstream?				49
(F) Any debris in the reservoir?				50
(G) Other?				50

6. INSTRUMENTATION

(A) List type(s) of instrumentation:				27-33
(B) In good condition?				27-33
(C) Read periodically?				27-33
(D) Is data available?				27-33
(E) Include all data gathered since last report.				

7. DOWNSTREAM CONDITION

A. Downstream Land Use.

	41
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This dam was inspected by:

Additional comments and recommendations. (Use additional pages)





